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The Spectral Theorem for d-tuples of strongly commuting unbounded normal operators on a quaternionic Hilbert space

Abstract

In this talk we shall show that corresponding to a d-tuple of strongly commuting normal operators $(T_1, \dots, T_d)$ on a quaternionic Hilbert space $\mathcal{H}$, there exists a spectral measure E on the Borel sets of $\mathbb{C}_+^d := \{(\lambda_1, \dots \lambda_d) \in \mathbb{C}^d : \operatorname{Im} \lambda_n \geq 0\}$ such that

$$\langle T_n x, y\rangle = \int_{\mathbb{C}_+^d} \operatorname{Re}(\lambda_n) d\langle E(\lambda_1, \dots, \lambda_d)x, y\rangle + \int_{\mathbb{C}_+^d} \operatorname{Im}(\lambda_n) d\langle J_n E(\lambda_1, \dots, \lambda_d)x, y\rangle,$$

where $x \in \mathcal{D}(T_n)$ and J_n is some anti self-adjoint and unitary operator on $\mathcal{H}$ for $n = 1, \dots, d$.

The study of spectral theory for operators on a quaternionic Hilbert spaces is motivated by a general formulation of quantum mechanics formulated by Birkhoff and von Neumann. We shall also touch upon this connection.

This talk is partially based on joint work with D. Alpay and F. Colombo.

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Talk location: Crow 206

Special Session: Multivariable operator theory. Organized by H. Woerdeman.